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Accidental Dopamine in the Eye

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WE IN THE MEDICAL profession are frequently made aware of unusual and often unexpected side effects of commonly used drugs. These effects may appear either when the drug has been given in the usual manner or when the recommended dosage has been inadvertently exceeded. Occasionally an unanticipated reaction may arise when a drug is instilled via an unintended route. This may occur through the mucous membranes of the eye, which are capable of systemic drug absorption, as confirmed by recent reports of cardiovascular sequelae related to the use of pindolol, metoprolol and epinephrine eye drops.[1-3] In a review of reported systemic side effects of ophthalmic drugs in common usage before 1977, the use of at least one drug, phenylephrine, was found to be associated with several instances of serious untoward effects.[4] Persons working in chemical plants and laboratories know that the eyes are important areas for accidental drug contamination. I report a case of accidental instillation of dopamine in the eye of an intensive care unit nurse.

Report of a Case

A healthy 32-year-old woman, an intensive care unit nurse, accidentally splashed one or two drops of undiluted dopamine into her left eye while preparing a standard dilution for intravenous use. She dried the eye and continued to work until several minutes later when she noted the abrupt onset of dizziness, palpitations, facial flushing and a dry mouth. She went to the emergency room, where an electrocardiogram showed supraventricular tachycardia at a rate of 160 per minute with diffuse nonspecific ST-T abnormalities (Figure 1.) She was admitted to hospital for observation.

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Her medical history included mild hypertension of one year's duration, well controlled on a regimen of amiloride (5 mg) and hydrochlorothiazide (50 mg) every other day. She said she had no history of cardiac disease, rheumatic fever, heart murmur, chest pain, palpitations or dizziness and was receiving no other medications.

Findings of a physical examination were remarkable only for a pulse of 160 and a blood pressure of 152/100 mm of mercury. A cardiac examination done during periods of sinus rhythm showed no abnormalities. Laboratory results included normal values for blood count, electrolytes and free thyroxine. A standard M-mode echocardiogram was normal.

The patient's hospital course was characterized by spontaneously resolving periods of paroxysmal supraventricular tachycardia and intermittent sinus tachycardia, which gradually became less frequent. She was able to identify these as periods of flushing and palpitations. The episodes of tachycardia were not responsive to carotid sinus massage, but did revert on one occasion after she was given verapamil, 5 mg, intravenously. On the following day, an electrocardiogram was within normal limits (Figure 2). Except for fatigue and a fair amount of anxiety over the mishap, she was discharged in good condition on the third hospital day. Values for serum catecholamine and urine metanephrine obtained after her discharge were within normal limits.

Discussion

This case is a dramatic example of a seemingly innocuous amount of conjunctival contamination causing significant morbidity. It we estimate that there are ten drops per milliliter, one drop of undiluted dopamine (40 mg per ml) contains a dose of 4,000 μg. Assuming that only one drop contaminated the eye of this 65-kg woman, she received an approximate bolus of 60 μg per kg, not an inconsequential amount! There is little doubt that there was a direct causal relationship between the mishap and the ensuing events. Dopamine has well-known β-mimetic effects that could have been responsible for the tachycardia experienced by this woman.[5] When dopamine is given intravenously, its effect is gone within minutes. It was surprising to us that episodes of paroxysmal tachycardia continued for as long as 48 hours. This led us to exclude the possibility of underlying thyrotoxicosis, pheo-

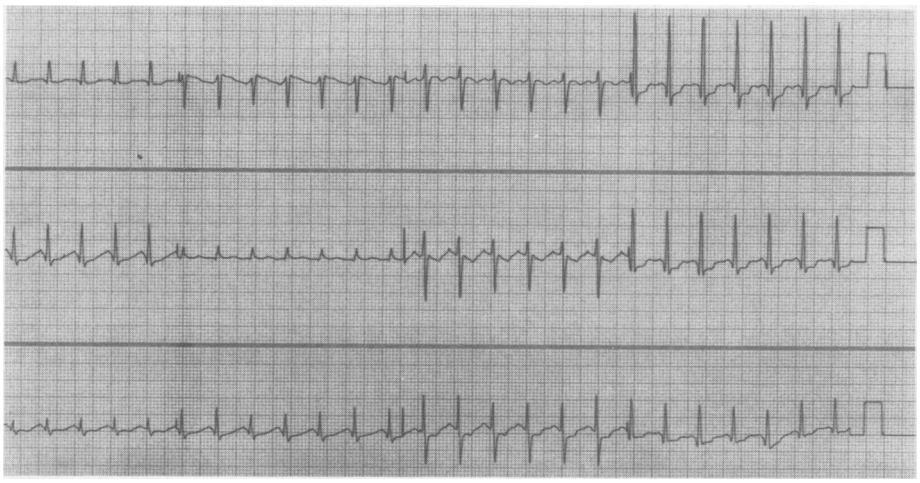

Figure 1.—Initial electrocardiogram.

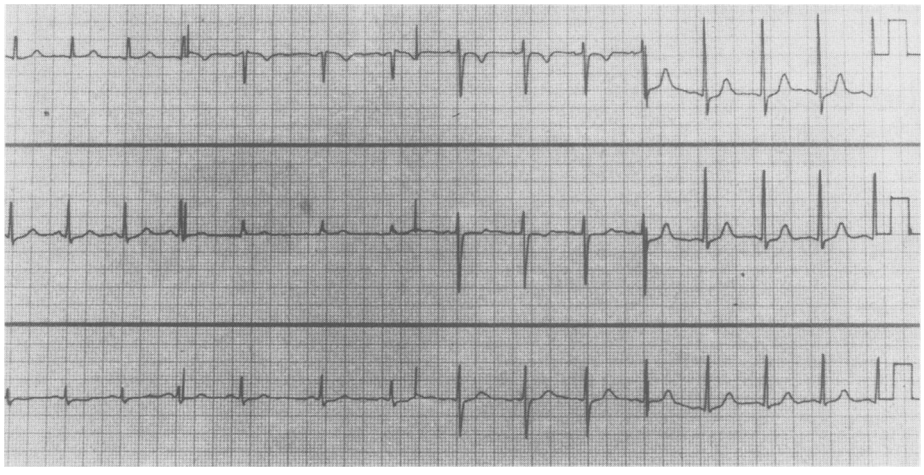

Figure 2.—Electrocardiogram done on second hospital day.

chromocytoma or cardiac disease. One possible cause of the prolonged effect is that there is a drug reservoir at the conjunctival membranes. Another possibility is that the considerable anxiety caused by the initial episode led to further episodes of tachycardia. This seems unlikely as a sole explanation, as the patient experienced some episodes during sleep.

The lessons from this case are several. First, persons in a hospital setting responsible for handling potent pharmacologic medications need to be reminded of the possibility that large-dose contamination can occur when seemingly small amounts of a drug are spilled on mucous membranes. Second, prompt irrigation or other appropriate measures should immediately be done if such an accident does occur.

A more interesting implication is the possible role of mucous membranes in drug administration. One intriguing and potentially useful technique might be the instillation of cardiac drugs through the mucous membranes of patients during cardiopulmonary resuscitation or other emergent situations before intravenous access can be established. Certainly the nasal mucosa and the underside of the lip and tongue are well-established routes for drugs; might not the eye provide yet another alternative?

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